Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Comment Sought to Update the	)	
Record on Ligado's Request That the	)	
Commission Initiate A Rulemaking to	)	RM-11681
Allocate the 1675-1680 MHz Band For	)	
Terrestrial Mobile Use Shared With Federal	)	
Use	)	
	)	
To: The Commission	)	

COMMENTS OF LIGADO NETWORKS LLC

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I. INTRODUCTION AND SUMMARY

The April 22, 2016 Public Notice inviting comment on the proposal to share the 1675-1680 MHz band with commercial use started an important dialogue on how the Commission can advance the goal, articulated on a bipartisan basis by the President and Congress, to make more spectrum available for next-generation mobile services while at the same time preserving the vital mission of the National Oceanic and Atmospheric Administration ("NOAA") and those academic, public, and other institutions which access the enormous amount of information NOAA gathers on a daily basis.[1] Ligado Networks ("Ligado") firmly believes that allocating the

[1] *Comment Sought to Update the Record on Ligado's Request that the Commission Initiate a Rulemaking to Allocate the 1675-1680 MHz Band for Terrestrial Mobile Use Shared with Federal Use*, RM-11681, DA 16-443 (Apr. 22, 2016) ("Public Notice").

band can be accomplished in a manner that protects NOAA as well as the non-NOAA users that rely on access to the NOAA information.

The question of whether the 1675-1680 MHz band should be allocated for terrestrial use has been asked and answered by the Obama Administration four times in the past four years, and each time the answer has been Yes. That same important policy question has been addressed by Congress multiple times in the past four years, and again, each time the answer has been Yes. The only remaining unanswered question is when the allocation should take place. The 2017 Presidential Budget states that the terrestrial use should commence not later than 2020. In order to activate a network, a licensee needs approximately three years to pair the spectrum with other bands, obtain approval from the global standards setting body, and discharge all the conditions and duties that are rightfully imposed on the licensee to serve and protect the public interest. The auction for 1675-1680 MHz should therefore be completed in 2017.

For this reason, Ligado urges the Commission to move promptly to a notice of proposed rulemaking ("NPRM") asking for comments on the reallocation. That NPRM should include all issues and concerns expressed by NOAA or any other possibly affected party as well as all the ideas expressed herein. Only then can every stakeholder comment, and only then will the Commission be in a position to move to a decision on the shared use of the band, related service rules, and auction methodology.

Making this spectrum available for commercial use would create a huge benefit for the American wireless industry, because if combined with other available spectrum, it would bring to consumers 40 megahertz of vital mid-band spectrum. As Chairman Wheeler recently made clear, "5G is a national priority," and mid-band spectrum—"the overlooked middle child" of the

spectrum trifecta—will create a tremendous opportunity for a greenfield deployment of 5G.[2]

These benefits can be realized while at the same time ensuring that neither NOAA nor any other entity that accesses NOAA's rich trove of weather data suffers any harm. Ligado looks forward to participating in a public discourse on these issues and to finding the right balance among the important uses of this band so that all of the public interest benefits from shared use of this band can be realized.

II. ALLOCATING THE 1675-1680 MHZ BAND TO SHARED COMMERCIAL USE IS CLEARLY IN THE PUBLIC INTEREST AND CONSISTENT WITH LONGSTANDING PRESIDENTIAL AND CONGRESSIONAL GOALS AND COMMISSION POLICIES

Assigning the 1675-1680 MHz band to auction for shared commercial use has received bipartisan support within Congress and has long been requested by the Obama Administration. The reallocation of this band plays a critical role in the Administration's and the Commission's[3] spectrum policy objective of making available 500 megahertz of federal and nonfederal spectrum suitable for broadband use.

Both the President and Congress have supported assigning the 1675-1680 MHz band to auction for shared commercial use. For the past four years, the President's budget has expressly discussed this initiative. The President's 2014, 2015, and 2016 budgets all proposed that the Commission should either auction or use fee authority to assign this spectrum to shared use. The budgets also explain that repurposing this band for commercial use could yield net savings of

[2] *The Future of Wireless: A Vision for U.S. Leadership in a 5G World*, June 20, 2016 (Statement of Tom Wheeler, Chairman, Federal Communications Commission), at 3.

[3] *See Spectrum Crunch*, Federal Communications Commission, https://www.fcc.gov/general/spectrum-crunch (last visited June 20, 2016).

$230 million over ten years.[4] The President's 2017 budget, submitted in February 2016, repeats the call for shared use, but also increases the net savings estimate to $300 million over ten years and stipulates that reassignment should occur soon so the spectrum can be put to use by 2020.[5] A recent report from the Senate Appropriations Committee echoes the call for shared commercial use. The report—which received bipartisan support—expressly states that the Committee supports the auction and the expeditious relocation of NOAA's operations to a different radio frequency band, provided that auction proceeds are used to offset NOAA's relocation costs.[6]

Furthermore, allocating this band for shared use is necessary to achieve the Administration's and the Commission's[7] broadband spectrum goals. In 2010, the White House issued a Presidential Memorandum that required the National Telecommunications and Information Administration ("NTIA") to work with the Commission to make available 500 megahertz of federal and nonfederal spectrum suitable for mobile and fixed wireless broadband use.[8] In its Ten-Year Plan and Timetable, developed to implement the presidential directive,

[4] *See Fiscal Year 2014 Analytical Perspectives, Budget of the U.S. Government*, Office of Management and Budget, at 228– 229; *Fiscal Year 2015 Analytical Perspectives, Budget of the U.S. Government*, Office of Management and Budget, at 199; *Fiscal Year 2016 Analytical Perspectives, Budget of the U.S. Government*, Office of Management and Budget, at 215.

[5] *See Fiscal Year 2017 Analytical Perspectives, Budget of the U.S. Government*, Office of Management and Budget, at 220.

[6] *See* S. Rep. No. 113-181, at 46–47 (2014).

[7] *See Spectrum Crunch*, *supra* note 3.

[8] *See* Memorandum from The White House, Office of the Press Secretary, *Unleashing the Wireless Broadband Revolution* (June 28, 2010), at Section 1(a), *available at* https://www.whitehouse.gov/the-press-office/presidential-memorandum-unleashing-wireless-broadband-revolution ("Presidential Memorandum").

NTIA identified the 1675-1680 MHz band as one of the bands to be included in the 500 megahertz initiative.[9]

Thus, calls to put the 1675-1680 MHz band to auction have been repeated year after year. As the Presidential Memorandum explains, it is possible to "unlock the value of otherwise underutilized spectrum and open new avenues for spectrum users to derive value through the development of advanced, situation-aware spectrum-sharing technologies."[10] With support for an auction arising across government agencies and across party lines, the value and benefits of making this band available for commercial use could not be more clear. The time is ripe for Commission action.

III. ALLOCATING THE 1675-1680 MHZ BAND TO SHARED COMMERCIAL USE CAN BE ACCOMPLISHED IN A MANNER THAT PROTECTS NOAA

The record has been established in this docket that dedicating the 1675-1680 MHz band to shared commercial use can be done in a manner that fully protects the incumbent user, NOAA. Ligado has submitted ample evidence demonstrating that NOAA's operations in the band can be protected when the band is shared with a commercial wireless network. NOAA's use of this band consists of two key components: NOAA's radiosonde (weather balloon instrument) operations, and NOAA's operations involving current and next generation Geostationary Operational Environmental Satellite (GOES and GOES-R). As a result of the Commission's AWS proceeding, NOAA will no longer need the 1675-1680 MHz band for its radiosonde operations once relocation is completed, and extensive analysis has already identified protection

[9] *See* National Telecommunications and Information Administration, Plan and Timetable to Make Available 500 Megahertz of Spectrum for Wireless Broadband 7 (October 2010), *available at* https://www.ntia.doc.gov/files/ntia/publications/tenyearplan_11152010.pdf.

[10] *See* Presidential Memorandum, *supra* note 8.

zones that can ensure NOAA's GOES and GOES-R operations are not affected by sharing the band.

A. The 1675-1680 MHz Band Is No Longer Necessary for NOAA's Radiosonde Operations

In May 2014, NTIA informed the Commission that NOAA radiosondes would have to be relocated out of the 1675-1683 MHz band to accommodate the transition necessary as a result of the AWS-3 auction.[11] Consistent with this plan, NOAA began transitioning radiosonde operations out of the band earlier this year, and that work is scheduled to be completed by 2021.[12] Accordingly, NOAA's radiosonde operations, once a key feature of NOAA's use of the 1675-1680 MHz band, will not be affected by shared commercial use of that spectrum when those operations commence. Instead, they will be able to operate safely in their new location.

In 2013, prior to the NTIA decision to relocate the radiosondes to accommodate AWS-3, Ligado (then LightSquared) commissioned, at NOAA's request, a comprehensive engineering assessment to determine the feasibility of a commercial wireless operator sharing the 1675-1680 MHz band with NOAA and the technical and operational parameters under which such operation could occur. Alion Science and Technology ("Alion"), an organization selected based on NOAA's recommendation, conducted the engineering assessment in 2013 and 2014 and concluded that NOAA facilities could be adequately protected.

The Alion study's conclusions were consistent with the NTIA decision: one of the key methods for protecting NOAA's operations is relocating NOAA radiosondes. The study

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[11] *See* Letter from Lawrence E. Strickling, Administrator, National Telecommunications and Information Administration, to Tom Wheeler, Chairman, Federal Communications Commission (May 13, 2014), at Attachment B1, *available at* https://www.ntia.doc.gov/files/ntia/publications/notification_to_fcc_re_est_costs_for_1695_and_1755_bands_05132014.pdf.

[12] Public Notice, *supra* note 1, at 3.

explained that the prime option for radiosonde operation relocation was the 400.15-406 MHz band—a band which was already allocated for radiosonde operation and is the primary band used internationally for such operations.[13] The 400.15-406 MHz band was identified as having two primary benefits. First, because the 400.15-406 MHz is widely used internationally, its use by NOAA could lead to improved cost efficiencies in the purchase of radiosonde transmitters. Second, because of the advantageous propagation properties of this band relative to the 1675-1683 MHz band, it could enable the use of a much simpler receive system.

The report also explained that the feasibility of relocating radiosondes to this band should depend on potential impacts to existing operations in the 400.15-406 MHz band from radiosondes, as well as the corresponding impact to radiosonde receive stations from other transmitters in this band. Alion conducted analyses on both of these issues and concluded that relocation of radiosondes from 1675-1683 MHz to 400.15-406 MHz was indeed feasible.[14]

Because NTIA ordered the relocation of the radiosondes to protect NOAA's operations from the anticipated AWS-3 uses, one of the primary concerns with the potential commercialization of the 1765-1680 MHz band has already been addressed. However, to help ensure that all of NOAA's potential concerns are addressed—even those that have not yet been identified—the NPRM should ask whether there are any issues with radiosondes in adjacent bands. Relatedly, the NPRM should ask whether the auction winner would need to provide for the relocation of those radiosondes. The NPRM could also require the auction winner to study whether there is any actual interference for a twelve-month period (to capture the seasonal effects) following the conclusion of the auction and solicit stakeholder comments on the

[13] *See* 47 C.F.R. § 2.106.

[15] *See* Public Notice, *supra* note 1, at 3.

appropriate parameters for such an interference study. These additional requirements can help identify and mitigate any new concerns that have not yet been surfaced and ensure continued smooth operations for NOAA.

B. Protection Zones Can Guard Against Impacts to NOAA's Current and Future Operations in the 1675-1680 MHz Band

The other key feature of NOAA's use of the 1675-1680 MHz band involve**s** satellites NOAA uses to collect weather data for transmission to four ground stations (Wallops Island, VA; Greenbelt, MD; Omaha, NE; Fairbanks, AK).[15] NOAA operates a group of Geostationary Operational Environmental Satellites (GOES), which serve a variety of functions related to the collection and dissemination of weather data and alerts. The current generation of GOES satellites (GOES NOP) was first launched in 2006 and came into operational service in 2010.[16] GOES NOP provides data and alerts to NOAA and other users via several streams, including the SD Link, Command and Data Acquisition link, Multi-Use Data Link, GOES-Variable, Data Collection Platform Report, Emergency Managers Weather Information Network**,** and the Low Rate Information Transmit.

NOAA is also proceeding to deploy the next generation of GOES satellites. GOES-R is the first satellite in the next-generation of GOES services. It is scheduled for launch on November 4, 2016 and will transmit to more than 20 NOAA earth stations.[17] The operation of the GOES-R satellite will initiate a reconfiguration of NOAA's satellite spectrum to

[15] *See* Public Notice, *supra* note 1, at 3.

[16] *See GOES-N Series*, National Aeronautics and Space Administration, http://www.nasa.gov/mission_pages/goes-n/index.html (last visited June 21, 2016); *GOES Flyout Chart as of 01/01/16,* National Oceanic and Atmospheric Administration, http://www.nesdis.noaa.gov/flyout_schedules.html (last visited June 21, 2016).

[17] *See Countdown to GOES-R Launch*, National Oceanic and Atmospheric Administration, www.goes-r.gov (last visited June 21, 2016).

accommodate new features and services available through the new generation of weather satellites. Accordingly, some services will be changed, consolidated and/or relocated in the spectrum band. There will be an extended period during which the new and previous generations of GOES satellites operate simultaneously.[18] The replacement of the remaining GOES NOP satellite is scheduled for 2020,[19] and the satellites will provide different services on different frequencies during the intervening time period.

The Alion report concludes that both GOES and GOES-R can be protected against interference from shared commercial use of 1675-1680 MHz through the creation of protection and coordination zones. The Alion study also identifies and sets out the necessary parameters for those protection and coordination zones. Specifically, the Alion report lists in kilometers the protection zone distances required for each relevant NOAA facility for the NOAA services conducted in the 1675-1680 MHz and adjacent band. The Alion report thus specifies the ways in which commercial terrestrial services can be deployed in the band while NOAA services remain protected. The Commission should include these protection and coordination zones in its proposed rules for the band and require any licensee to adhere to them to protect this important aspect of NOAA's operations.

IV. IF THE COMMISSION DETERMINES SHARED USE WILL CAUSE HARMFUL INTERFERENCE TO NON-NOAA USERS, THEN IT SHOULD REQUIRE A NEW CONTENT DELIVERY NETWORK TO SERVE NON-NOAA USERS AS WELL AS SCHOOLS, LIBRARIES, AND THE GENERAL PUBLIC

A. As a Threshold Matter, the Commission Should Determine If Shared Use Will Cause Harmful Interference to Unlicensed Entities That Access NOAA's Weather Transmission

[18] *See Goes Flyout Chart*, *supra* note 16.

[19] *See id.*

Ligado has held extensive discussions with NOAA for a number of years on how the 1675-1680 MHz band can be shared in a way that ensures unimpaired operations for NOAA in the band. As demonstrated above, this discussion, which first started in 2012, led to detailed analysis that has been submitted into the record. Only in June 2015 did Ligado learn for the first time from NOAA officials their concerns about the potential for interference to those unlicensed entities that essentially "listen in" on NOAA's transmission in order to gain access to NOAA's weather data.[20] Since June 2015, Ligado has done all that it could to identify possible users in an effort to understand how they access and use the NOAA data (NOAA has told Ligado repeatedly that it has no significant information on these entities). Ligado's report on that effort was filed in this proceeding in November 2015.[21] That report concluded that these entities used a variety of NOAA data and that the data distribution function currently served by NOAA's satellite to these unlicensed users could be met by alternative means, such as a content delivery network.[22]

There have been some submissions into the record expressing concern about interference to non-NOAA users, but there is no evidence in the record documenting that shared use of the 1675-1680 MHz band will cause harmful interference to these unlicensed entities.[23] The Commission prefers a "fact-based, data-driven approach" to its policy-making decisions,[24] and the present situation should not stray from this approach. As described above, a fact-based, data-

[20] *See* Public Notice, *supra* note 1, at 5.

[21] *See Assessment of the 1675-1680 MHz Band*, RM-11681; IB Docket No. 12-340; IBFS File Nos. SAT-MOD-20120928-00160; SAT-MOD-201220928-00161; SES-MOD-20121001-00872 (filed Nov. 5, 2015) ("1675-1680 MHz Assessment").

[22] *See id.* at 15–21; *see also* Public Notice *supra* note 1, at 5.

[23] *See, e.g.*, Comments of The Weather Company, an IBM Business, RM-11681 (filed June 17, 2016); Comments of American Weather and Climate Industry Association, RM-11681 (filed June 17, 2016).

[24] *Data Innovation Initiative*, Federal Communications Commission, https://www.fcc.gov/general/data-innovation-initiative (last visited June 20, 2016).

driven approach has been applied to assessing the impact of shared use on NOAA's operations. In other contexts, the same fact-based, data-driven approach has been taken, both on an experimental and theoretical basis, concerning LTE's operations on GPS devices.[25] The Obama Administration has concluded on four separate occasions, including most recently in February 2016, that it is in the public interest for this spectrum to be allocated to shared commercial use. Those who suggest that the Administration's decision, which was endorsed on a bipartisan basis in Congress, is erroneous should have the burden of establishing why that is so with a fact-based, data-driven showing.

B. To Ensure Access for Non-NOAA Users, and Benefit Schools and Libraries, the Commission Should Require the Auction Winner to Fund an Alternative Content Delivery Network

If the Commission finds that shared use of the band could cause harmful interference to the unlicensed entities that access NOAA's weather data, there are readily available and widely-deployed technology solutions, such as fiber optic or cloud-based networks, that can be used to ensure there is no disruption for the community of non-NOAA users that rely on this data. Several of these entities have recently submitted comments in this proceeding expressing concern over losing the data they currently receive from NOAA.[26] However, Ligado is *not* suggesting in any way that the data currently provided by NOAA not be provided or be provided in ways that may make it susceptible to interference. Instead, recognizing the importance of this data to the existing users—and other future users—Ligado has proposed that if the Commission finds it necessary, the winner of the auction for this band should be required to implement a new data content delivery network as an alternative to the satellite-delivered data stream these non-

[25] *See* Roberson and Associates, LLC, *Results of GPS and Adjacent Band Co-Existence Study*, IB Docket No. 11-109, at 2 (filed May 11, 2016).

[26] *See supra* note 23.

NOAA users currently receive.[27] Ligado's proposed content delivery network would deliver information in a manner that is equal to—if not better than—the quality of the information these users currently receive. Furthermore, the new network would expand access to NOAA data to schools, libraries, and the general public, advancing the Administration's Open Data Initiative and the Commission's efforts to bolster science, technology, engineering, and math ("STEM") education.

In its February 9 *Ex Parte* Letter, Ligado proposed the Commission require, if necessary, the auction winner of the 1675-1680 MHz band to create a new, non-profit corporation responsible for delivering unaltered weather data from the GOES satellites to non-NOAA users via a terrestrial, cloud-based network.[28] Ligado's plan envisions a content delivery network ("CDN") that would acquire NOAA-processed data content (the GOES Rebroadcast, or "GRB") directly from the NOAA GRB production generation facility based in Wallops Island, Va. and then distribute the acquired content unaltered, in near-real-time, to non-NOAA users by means of a terrestrial, fiber-optic or cloud-hosted private content delivery network (Ligado's proposed CDN, the "GRB-T").[29] This plan envisions the winner of the 1675-1680 MHz spectrum auction

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[27] *See* Letter from Gerard J. Waldron, Counsel to New LightSquared LLC, to Marlene H. Dortch, Secretary, Federal Communications Commission, RM-11681; IB Docket No. 12-340; IB Docket No. 11-109; IBFS File Nos. SES-MOD-20151231-00981; SAT-MOD-20151231-00090; SAT-MOD-20151231-00091, at 1 (Feb. 9, 2016) ("February 9 *Ex Parte* Letter").

This proposal assumes that NOAA does not have such a delivery system in place today or does not plan to implement one. Ligado is not aware of any such system, and in its numerous conversations with NOAA has not been informed of any such systems. However, a presentation from a recent NOAA GOES-R User Readiness Meeting suggests that such a system could already be in the process of being implemented by NOAA. *See* Kathryn Miretzky, *GOES-R Product Distribution Logistics Before and After Handover* (May 9, 2016) *available at* http://www.goes-r.gov/users/docs/2016/Satellite%20Proving%20Ground-User%20Readiness%20Meeting%202016/May%209/Kathryn_Miretzky_proddistrologistics_17May2016.pptx.

[28] *See* February 9 *Ex Parte* Letter, *supra* note 27, at 1.

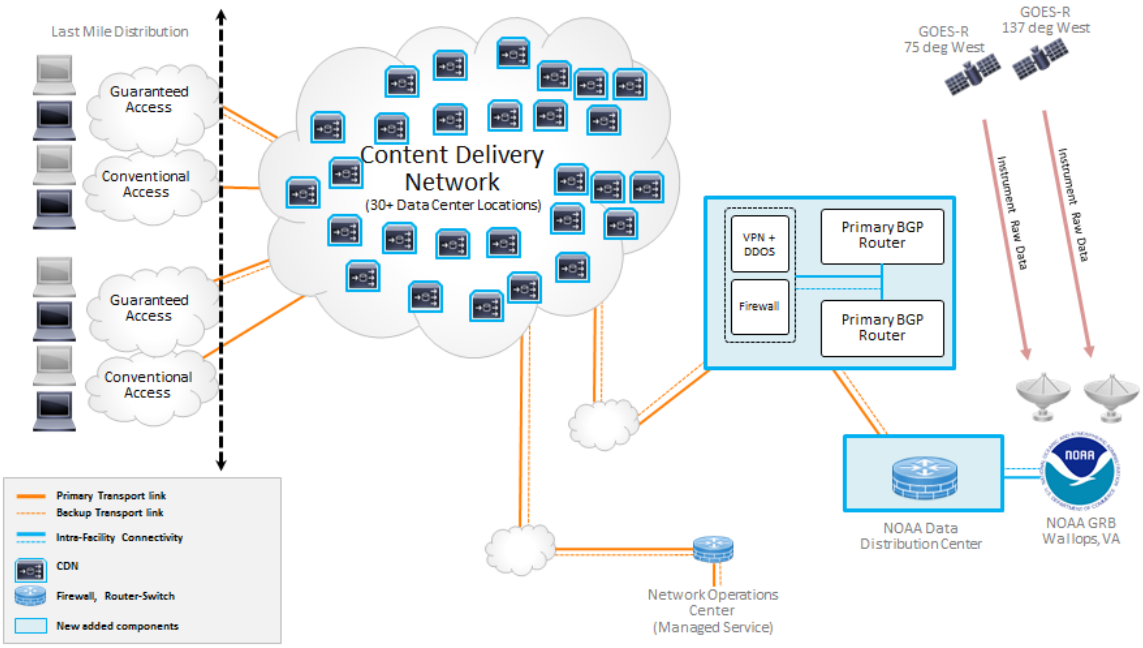
[29] *See id.* at slide 3.

being required, as a license condition, to fund an independent, non-profit body that in turn would operate and maintain the GRB-T. This proposed terrestrial network would have many advantages over current satellite delivery. For instance:

- CDN distribution would require no NOAA-owned physical servers, as the CDN application would be hosted in a private cloud. Data would also be stored at the network level for later retrieval by end users. This could be useful for long-term research about subjects such as climate change and is not currently possible today with satellite-delivered data.
- The entire dataset would be replicated across the country, meaning that users would be able to download content faster from the nearest storage facility in near-real-time.
- Much higher, scalable bandwidth would exist compared to current satellite delivery. This could enable future integration of cutting innovations.
- A design based on next generation IP distribution with Quality of Service would provide reliable and faster multicast transmission.

The following diagram illustrates how the proposed GRB-T would acquire NOAA data and deliver it to users.

GRB-T Private Cloud CDN (Content Delivery Network)



Ligado's proposal also includes two key elements that will expand the reach of this valuable government data to new users. *First*, the data will be much more accessible. Currently, accessing the GRB data requires a purpose-built L-Band RF receiver and accompanying software, which entails significant costs. Needless to say, the number of high school science classes or urban libraries that can afford a satellite dish is limited. Under Ligado's proposal, the GRB-T would be accessible from any general purpose computing platform (such as a desktop or laptop computer, tablet, or smartphone) broadening the base of potential users immeasurably. *Second*, it is Ligado's understanding that the GRB data currently does not exist in a structured database and is not coded in open access format. Accordingly, today's non-NOAA users are sophisticated academic institutions, for-profit enterprises, and public agencies that have the resources and skills to interpret the data. Ligado's proposal would allow research tools, such as the ability to search and sort the dataset according to a variety of factors, to be implemented. Together, these two developments will open the dataset up to a new class of potential users who previously had no ability to access or decipher it.

In addition to requiring the auction winner to fund the non-profit body that would operate and maintain the GRB-T, Ligado believes non-NOAA users should play a substantial role in the governance of the GRB-T. There are still a variety of questions, however, regarding the features of this nonprofit and the eligibility criteria that the Commission should consider for inclusion in the NPRM. For example:

- The non-NOAA users could create the non-profit entity themselves, or the auction winner could create the entity.
- The auction winner could provide up-front funding for the non-profit sufficient to cover capital and operating costs for a ten-year period, or the auction winner could provide funding to the entity in stages to ensure sound fiscal management.

- The end-user Internet connection could be the responsibility of each end user, as is it today, or the auction winner could fund a limited number of end user connections for those who previously did not have sufficient capacity to access the data.

- The auction winner could have no ongoing role in the management of the CDN beyond up-front funding, or the auction winner could have one seat on the board of the new entity to ensure that there is clear communication from the entity to the funder.

- Existing non-NOAA users could be permitted to join the entity at no cost for 10 years, but new users could be required to pay fees based on incremental costs or based on fully allocated costs.[30]

In deciding the answers to these key questions, the Commission should consider inviting comment on different models that it has observed in other contexts such as EveryoneOn, Internet2, and the SHLB Coalition, as well as clearinghouses the Commission has used in other spectrum contexts.[31] The new non-profit could even be affiliated with one of these existing organizations.[32]

C. Providing This Data to a Broader User Base Will Spark Innovation, and Benefit Schools, Libraries, and the General Public

Providing NOAA's rich trove of weather information online would further the Administration's Open Data Initiative, advance the Commission's efforts to bolster STEM education, and benefit students across the country. In a May 2013 Executive Order, President Obama ordered that government information should by default be open and accessible to the public, stating:

> To promote continued job growth, Government efficiency, and the social good that can be gained from opening Government data to the public, the default state of new and modernized Government information resources shall be open and machine readable. Government information shall be managed as an asset throughout

[30] *See* Declaration of John Windhausen, Jr., Attachment, at 2–3 .

[31] *See id.* at 4.

[32] *See id.* at 3.

> its life cycle to promote interoperability and openness, and, wherever possible and legally permissible, to ensure that data are released to the public in ways that make the data easy to find, accessible, and usable.[33]

Entrepreneurs and policy specialists commended this announcement for its intent to make government information more open and accessible to ordinary citizens.[34] Ligado's proposed GRB-T would squarely accomplish the goals set forth in the Open Data Initiative. No longer would the data of one of the government's key scientific agencies be available to only resource-rich entities in select echelons of government, business, and academia. Instead, any given 9th-grade science class that discusses El Niño would be able to sit down in front of classroom computers and have access to the very same taxpayer-funded information as do the scientists who are able to predict when it will start raining tomorrow.

The proposal to bring this vast data to everyone also would directly advance the Commission's repeatedly-stated interest in supporting investment in STEM education.[35] As explained in the Commission's *National Broadband Plan*, "providing access to more online learning systems, coursework and materials in STEM can improve opportunities for students who are interested in working in these areas but lack local, high-quality learning opportunities." The instant proposal directly addresses this issue. It can transform information that is currently available to only those who can afford a multi-thousand-dollar satellite dish into the accessible, "high-quality learning opportunities" the Commission seeks to promote.

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[33] Executive Order 13642, *Making Open and Machine Readable the New Default for Government Information*, 78 FR 28111 (May 14, 2013).

[34] *See* Nick Sinai and Haley Van Dyck, *Recap: A Big Day for Open Data*, White House Office of Science and Technology Policy Blog (May 10, 2013), https://www.whitehouse.gov/blog/2013/05/10/recap-big-day-open-data.

[35] *See, e.g.*, *Connecting America: The National Broadband Plan*, at 233 (Mar. 17, 2010), https://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf.

Furthermore, this expansion of opportunity can be accomplished at little to no cost to new end users. The Commission has the opportunity to maintain the non-NOAA users' current access to the GOES-R data while also giving students across the country the ability to study and interpret this vital government resource and develop their interest in meteorology, data analysis, and other key skills in today's technological world. Accordingly, the Commission should require the winner of the 1675-1680 MHz auction to develop a network to deliver the GRB data to all potential users, along with the tools to search and sort the data. To pass up such an opportunity would be to pass up the chance to democratize information.

CONCLUSION

The record in this proceeding provides the Commission with substantial factual and legal support to initiate a rulemaking to allocate the 1675-1680 MHz band for shared terrestrial mobile use—and finally enable this spectrum to meet the American people's growing demand for wireless broadband service. For the reasons set forth herein, the Commission should move expeditiously to issue a NPRM asking for comments on such allocation.

Respectfully submitted,

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DECLARATION OF JOHN WINDHAUSEN, JR.

1. My name is John Windhausen, Jr. I am the President of Telepoly Consulting; in this capacity I provide legal and policy consulting services concerning broadband and telecommunications issues to corporations and non-profit organizations. I also serve as the Executive Director of the Schools, Health, and Libraries Broadband Coalition ("SHLB"), a non-profit, 501(c)(3) advocacy organization that supports open, affordable, high-capacity broadband connections for anchor institutions and their surrounding communities.

2. Through my work with SHLB, I have first-hand experience in creating, incorporating and directing a non-profit organization with a wide range of members to promote broadband use for a diverse group of users. SHLB has 60 members as of June 2016, representing libraries, elementary and higher education institutions, tele-health networks, commercial, municipal, and non-profit wireline and wireless broadband companies, state broadband offices, advanced research networks, consulting firms, and public interest organizations.

3. I have been retained by Ligado Networks' counsel to advise Ligado regarding the creation and implementation of a non-profit organization to work with Ligado's engineering team to design a terrestrial data delivery network that would provide an alternative to the NOAA-generated data stream that non-NOAA users currently "listen in" on as NOAA distributes the data to its earth stations.

4. Ligado has proposed that the winner of the 1675-1680 MHz auction would create a new, non-profit corporation to deliver unaltered data directly to non-NOAA users over a high-quality Internet-based network. Under Ligado's proposal, the auction winner would be required as a license condition to fund the design and implementation of this terrestrial, content delivery network (GRB-T) for a period of 10 years. The non-NOAA users would play a substantial role in the governance of the GRB-T.

5. The FCC would need to consider several management and operations options for this non-profit. I have identified the following options and suggestions:

i. The non-NOAA users could create the non-profit entity themselves, or the auction winner could create the entity.

ii. The auction winner could provide up-front funding for the non-profit sufficient to cover capital and operating costs for a ten-year period, or the auction winner could provide funding in stages to the entity to protect against fraud.

iii. The end-user Internet connection could be the responsibility of each end user, as is it today, or the auction winner could fund a limited number of end user connections for those who previously did not have sufficient capacity to access the data.

iv. The auction winner could have no ongoing role in the management of the CDN beyond up-front funding, or the auction winner could have one seat on the board of the new entity to ensure that there is clear communication from the entity to the funder.

v. The non-profit, and not the auction winner, would be responsible for advertising and marketing its services to non-NOAA users.

vi. The non-profit would be incorporated within 6 months of the license being awarded, or the FCC could encourage the users to create the entity prior to the auction, and ensure they are reimbursed after the licensee is awarded its license.

vii. The non-profit could be a new, independent non-profit organization, or it could be affiliated with an existing non-profit such as SHLB or another similar group.

viii. Existing non-NOAA users would be permitted to join the entity at no cost for 10 years, but new users could be required to pay fees based on incremental costs or based on fully allocated costs.

ix. The non-profit's initial board could be appointed by the FCC in consultation with NOAA, or the FCC could appoint the first few board members and let them decide how to draft by-laws to create a full board.

x. The full board would hire the executive director, who would then hire staff as appropriate.

xi. The FCC should promulgate rules to require an annual audit of the non-profit's expenses.

6. In deciding the answers to these key questions, the Commission should consider inviting comment on different models that it has observed in other contexts such as SHLB, EveryoneOn, and Internet2, as well as clearinghouses the Commission has used in other spectrum contexts.

7. As the Founder and Executive Director of SHLB for the last seven years, I am confident this type of non-profit can succeed and provide the non-NOAA users with service equivalent to or better than what they currently receive.

Signed: ____/s/_____

John Windhausen, Jr.

Date: June 21, 2016